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To cite this article: Qurat-ul-ann Azmat & Abdullah Muhammad Iqbal (2017) The role of financial constraints on precautionary cash holdings: evidence from Pakistan, Economic Research-Ekonomska Istraživanja, 30:1, 596-610, DOI: [10.1080/1331677X.2017.1305770](https://doi.org/10.1080/1331677X.2017.1305770)

To link to this article: <http://dx.doi.org/10.1080/1331677X.2017.1305770>



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Published online: 11 Apr 2017.



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# The role of financial constraints on precautionary cash holdings: evidence from Pakistan

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## ABSTRACT

This study aims to investigate the direct relationship between precautionary cash holdings, cash flow volatility and the financial constraints of Pakistani firms for the period 2003–2013. The study also takes into account the 2008 financial crisis. This study seeks to discover that if a firm is financially constrained and its cash flows are highly volatile then it will increase its cash holdings and voluntarily reduce its current investment level due to the intertemporal trade-off between current and future investments. Thus, a positive relationship between cash holdings and future cash flow volatility and a negative relationship between current investments and future cash flow volatility is expected. In order to test the impact of cash flow volatility firms are classified into constrained and unconstrained groups on the basis of four criteria, i.e., firm size, dividend payment, Kaplan-Zingales (KZ) index and group affiliation. For each criterion estimation is done by using two steps Generalised Method of Moments (GMM) estimator. Results show that financially constrained firms increase their cash holdings when cash flow volatility increases while financially unconstrained firms do not, except for KZ index criteria. It is also found that during the 2008 financial crisis constrained firms were more prone to saving cash than unconstrained ones. The study provides important insights into understanding the behaviour of Pakistani firms relating to cash holdings when they are financially constrained and cash flows are highly volatile. This is the first study of its kind that establishes a conclusive relationship between precautionary cash holdings, cash flow volatility and financial constraints in a Pakistani context.

## ARTICLE HISTORY

Received 14 July 2014  
Accepted 10 February 2017

## KEYWORDS

Cash holdings; cash flow volatility; financial constraints; financial crisis; panel data; Generalised Method of Moments (GMM)

## JEL CLASSIFICATIONS

G30; G32; G39

## 1. Introduction

Keynes (1936) has explained two major benefits of holding cash. First, a firm can save transaction cost by using cash to make payments rather than raising funds externally. Second, the precautionary motive of holding cash, in which a firm can reserve cash to hedge against future cash shortfall. Thus, cash holdings can be considered valuable assets of the firm when other sources of funds are insufficient to fulfil the firm's demand for capital. This situation becomes more pronounced when firms face external financing constraints to fund

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expenditures. In support of this view, several studies reported that firms with greater difficulties in obtaining external capital save more cash than firms with fewer frictions (see, for example, Almeida, Campello, & Weisbach, 2004).

In this study, cash holdings in the developing market is investigated which is different in governance and institutional framework from the US and UK (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1997). In cash holding literature there are studies which have pointed out that there are significant differences among the cash holding behaviour of developed and developing countries (see, for example, Islam & Mozumdar, 2007; Fernandes & Gonenc, 2014; Kusnadi & Wei, 2011). However, Al-Najjar (2013) observed that there are similarities between developed and developing countries on the factors determining cash holdings. Investigating this debate in developing markets emphasises the importance of strategic decision of cash holding, which has been under-researched in the previous literature.

This study is important in developing country context, such as Pakistan's, because it is considered as having lower level of financial intermediary development, stock market development, legal system inefficiency and lower GDP per capita (Beck, Demirgüç-Kunt, Laeven, & Maksimovic, 2006). Moreover, firms in Pakistan are characterised as having concentrated ownership, family control business groups, pyramidal structures, interlocking directorship and cross shareholdings (Cheema, 2003; Zaidi & Aslam, 2005; Javed & Iqbal, 2006). All those factors create costly external financing for firms operating in developing markets. However, developed financial systems can get cheaper external financing by mitigating the market imperfections; this situation leads to more dependency on internally generated funds in developing markets (Arslan, Florackis, & Ozkan, 2006). Thus, Pakistan is considered as a financially underdeveloped country in which firms face external financing constraints (Khurana, Martin, & Pereira, 2006). Love (2003) also found that financing constraints, measured by the sensitivity of investment to internal funds, decrease with financial development. Thus, it implies that firms' investment policy in developing (developed) markets relies more (less) on the availability of internal funds.

Rajan and Zingales (1998) argued that well developed 'financial markets and institutions help a firm overcome problems of moral hazard and adverse selection, thus help reducing the firm's cost of raising money from outsiders' (p. 560). In contrast, these problems become severe in countries which are less financially developed and where institutions are less protective of investor interests. This situation creates a wide wedge between firms' internal and external costs of funds (La Porta et al., 1997). Javed and Iqbal (2007) showed that weak governance practices affect the external financing needs of corporations in Pakistan; thus, the firms rely more on internal funds for supporting their growth opportunities.

Acharya, Almeida, and Campello (2005) provided evidence that cash balances secure investment through hedging against cash flow deficits. Thus, it can be argued that financing constraints create a demand for greater liquidity in order to reduce the impact of financing frictions and this need becomes greater in less developed markets (Arslan et al., 2006). The above findings have implications for firms in Pakistan because, as the evidence shows, Pakistan is not only financially underdeveloped but its corporate governance systems are also not strong enough to protect the rights of investors. Thus, making external finance costly and encourages firm to save more cash and ease the impact of financial constraints.

The study also takes into account the impact of the 2008 financial crisis for Pakistani firms. The view that the real economy may suffer from a credit crunch as a result of the subprime meltdown is far from self-evident. As Bates, Kahle, and Stulz (2009) carefully

document, non-financial firms held an abundance of cash prior to the crisis. According to them:

... the net debt ratio (debt minus cash, divided by assets) exhibits a sharp secular decrease and most of this decrease in net debt is explained by the increase in cash holdings. The fall in net debt is so dramatic that average net debt for US firms is negative in 2004. In other words, on average, firms could have paid off their debt with their cash holdings (p. 1986).

Given the apparent secular downward trend in cash holdings, the net debt ratio was likely even further into negative territory by mid-2007, right before the start of the full-blown subprime crisis. This at least suggests the possibility of no serious liquidity tightening outside the financial sector. Probably due to of this belief, Federal Reserve Chairman Ben S. Bernanke called strong corporate balance sheets 'a bright spot in the darkening forecast' during his testimony at the US Congress on monetary policy on 27 February 2008 (Tong & Wei, 2009).

Pakistan's economy is still relatively less integrated with the global economy in comparison to some of its neighbours, such as China and India. The low level of integration kept the economy insulated to some extent (Draz, 2011).

According to the 2007–2008 Financial Stability Review from the State Bank of Pakistan (SBP), 'Pakistan's banking sector has remained remarkably strong and resilient, despite facing pressures emanating from weakening macroeconomic environment since late 2007'. According to Fitch Ratings, the international credit rating agency with head offices in New York and London, 'the Pakistani banking system has, over the last decade, gradually evolved from a weak state-owned system to a slightly healthier and active private sector driven system'. The data from the banking sector for the final quarter of 2008 confirms a slowdown after a multi-year growth pattern. In October 2008, total deposits fell from Rs3.77 trillion in September to Rs3.67 trillion. Provisions for losses over the same period went up from Rs173 billion in September to Rs178.9 billion in October. At the same time, the SBP has jacked up interest rates: the three-month Treasury bill auction saw a jump from 9.09% in January 2008 to 14% in January 2009, and bank lending rates are now as high as 20%. Overall, Pakistan's banking sector has not been as prone to external shocks as the banks in Europe. Liquidity is tight, certainly, but that has little to do with the global financial crisis and more to do with heavy government borrowing from the banking sector, and thus tight liquidity and the 'crowding out' of the private sector.

The Karachi Stock Exchange (KSE) is Pakistan's largest and most liquid exchange. *BusinessWeek* cited it as the 'best-performing stock market in the world' for the year 2002. On the last trading day in December 2008, the KSE listed a total of 653 companies, with an accumulated market capitalisation of Rs1.85 trillion (\$23 billion). The KSE – as represented by the KSE-100 Index – had its highest close ever on 26 December 2007, at 14,814 points with a market capitalisation of Rs4.57 trillion (\$58 billion). As of 23 January 2009, the KSE-100 Index stood at 4929 points with a market capitalisation of Rs1.58 trillion (\$20 billion), a loss of over 65% from its highest point. According to estimates of the SBP, foreign investment in the KSE stands at around \$500 million. Other estimates put foreign investment at around 20% of the total free float. During the 2006 and 2007 calendar years, foreign investors were actively investing in KSE-listed securities. In September 2007, however, Standard & Poor's cut its outlook for Pakistan's credit rating to 'stable' from 'positive' on concerns over deteriorating security. On 5 November 2007, Moody's Investors Service announced that Pakistan's credit rating had been placed 'under review'. The end of 2007

was a bleak one for the KSE. Uncertainties over the upcoming Pakistani general election, a troubling macroeconomic scenario, an active insurgency in the Federally Administered Tribal Areas (FATA), double-digit inflation, a ballooning trade deficit, an unsustainable budgetary deficit and a worrying drop in foreign currency reserves created a dark, threatening cloud over the market.

The global financial crisis and the accompanying global credit crunch had only a minor direct impact on Pakistan, but the Pakistani economy remains in dire straits. For the 2008–2009 fiscal year, Pakistan needed a colossal \$13.4 billion foreign inflow of capital (Saleem, 2009).

Earlier studies have extensively studied the transaction motive of holding cash. But the precautionary motive has not been adequately discussed in the literature (see, for example, Han & Qiu, 2007). There are studies which have explained that cash flow volatility could affect a firm's cash holding behaviour (see, for example, Mikkelsen & Partch, 2003; Opler, Pinkowitz, Stulz, & Williamson, 1999). These studies suggest that firms use internally generated funds to hedge against future cash flow uncertainty and to increase their cash holdings in response to increase in cash flow volatility. This is the first study of its kind which has provided a direct analysis of the relationship between cash holdings, cash flow uncertainty and financial constraints in the context of Pakistan. Furthermore, it also takes into account the impact of the 2008 financial crisis on Pakistani listed firms.

The present study complements the findings of Han and Qui (2007), which have shown that the impact of cash flow volatility on a firm's cash holdings depends upon its financial constraints. A financially constrained firm increases its cash holdings when there is an increase in cash flow volatility. While, there is no systematic relationship between cash holding and cash flow volatility for unconstrained firms. Furthermore, the findings are an extension of the results of Opler et al. (1999) and Drobetz and Gruninger (2007) in which they reported a positive relationship between volatility and cash holdings. However, they did not examine the mediating role of financing constraints. This study moves a step forward by providing the direct relationship between cash flow volatility, financial constraints and cash holdings of Pakistani firms in the presence of the 2008 financial crisis.

## 2. Related literature and testable hypotheses

After the seminal paper of Miller and Modigliani (1958), much research had objected to the substitutability of internal and external finance. The objection was mainly based on the notion that there exist imperfections in capital market. When firms face those limitations, they are forced to pay a premium for externally-raised over internally-generated funds while, those problems become less severe if a firm has more internal funds available. Conventional wisdom says, the more a firm is financially constrained either in the form of capital market terms or internal funds, the less it invests. It is argued that firms which are anticipating financing constraints in the future respond to those potential constraints by hoarding cash today. The first study which addressed the issue of financing constraints of the firm is by Fazzari, Hubbard, and Petersen (1988). They investigated the relationship between financing constraints and corporate investment. They argued that changes in cash flow will be an important determinant of marginal capital spending for constrained firms when external financing is costly and sensitivity of investment to cash flow will be increasing in the degree of financial constraints.

Later, Fazzari et al.'s (1988) study was challenged on both an empirical and theoretical basis. Kaplan & Zingales (1997) provided evidence that a greater sensitivity of investment to cash flow is not a reliable measure of the differential cost between internal and external finance. Their results showed that financially less-constrained firms exhibit significantly greater investment cash flow sensitivity than more financially constrained firms. Alti (2003) further demonstrated that although cash flows contain valuable information about the firm's investment opportunities, the cross-sectional patterns reported by Fazzari et al. (1988) can be consistent with the model with no financing frictions.

Because of certain criticisms associated with the use of investment cash flow sensitivities in determining whether costly external finance affects financial policies. Almeida et al. (2004) used a different approach; they focus on cash flow sensitivity of cash. They explained that since cash is a financial as opposed to real variable, it is difficult to argue that the explanatory power of cash flows over cash policies can be attributed to its ability to forecast future business conditions. They proposed that financially constrained firms should have a systematic propensity to save cash, while unconstrained firms should not. Results showed that the cash flow sensitivity of cash is positive for constrained firms, but insignificant for unconstrained firms. Pulvino and Tarhan (2005) found that both constrained and unconstrained firms have similar positive cash to cash flow sensitivity, suggesting no impact of financial constraints. When using a simultaneous equation system and accounting for external financing's response to cash flow changes. Minton and Schrand (1999) documented the direct relationship between cash flow volatility and investment. They found that firms with high cash flow volatility invest less due to the high costs of external financing.

Almeida et al. (2004) argued that the link between financial constraints and a firm's demand for liquidity can help identify whether financial constraints are an important determinant of firm behaviour. They formalise a model in which firms anticipating financing constraints in the future respond to those constraints by hoarding cash today. Constrained firms choose their optimal cash policy by balancing the profitability of current and future investment. On the other hand, financially unconstrained firms have no use of cash, but also they bear no cost of holding it. The difference in the cash policies of constrained and unconstrained firms suggest that financial constraints should be related to a firm's propensity to save cash out of cash inflows while unconstrained firms should not. They test the model using manufacturing firms over the period 1971–2000. Firms are classified into constrained and unconstrained firms on the basis of five criteria, i.e., firm payout policy, asset size, bond ratings, commercial paper ratings and Kaplan-Zingales index. Consistent with the theoretical prediction results showed that constrained firms have significantly positive cash-cash flow sensitivities while unconstrained firms do not. Further, the results also showed that financially constrained firms' cash flow sensitivity of cash increases after negative macroeconomic shock while the unconstrained firms do not.

Based on the theoretical model of Almeida et al. (2004), Han and Qui (2007) determined firms' precautionary cash holdings in response of cash flow uncertainty. Results showed that financially constrained firms increase their cash holdings in response to an increase in cash flow volatility while, financially unconstrained firms do not. Therefore, for firms with access to capital markets the precautionary reason for holding cash will not be important.

Paul and Ferrando (2010) investigated the financial conditions of non-financial firms in Euro area. They followed the methodology of Almeida et al. (2004) that focuses on the analysis of cash flow sensitivity of cash holdings. Firms are classified in to three groups rather



than two based on the interrelation of several financial variables derived from balance sheet and profit and loss accounts. The groups are unconstrained firms, relatively constrained firms and absolutely constrained firms. Results showed that contrary to the previous evidence based mainly on US firms in Euro area the propensity to save cash out of cash flows is significantly positive regardless of firms' financing conditions.

For a sample of US firms Denis and Sibilkov (2007) further confirmed the results of earlier studies that cash holdings are more valuable for financially constrained firms than for unconstrained ones. This is because greater cash holdings are associated with higher levels of investment for both constrained and unconstrained firms, but the marginal value of investment is greater for constrained firms.

Another stream of literature studied the cross-sectional determinants of cash holdings. In those studies it is further confirmed that financially constrained firms hold more cash than unconstrained firms, for example Opler et al. (1999) found that firms with volatile cash flows, possess high growth opportunities hold high cash balances. Bates et al. (2009) noted the dramatic increase in cash holdings of US industrial firms from 1980–2006. They found that the increase in the industry cash flow risk is the main determinant of the increase in cash holdings and precautionary motive for cash holdings plays an important role in explaining the increase in cash ratios. McVanel and Perevalov (2008) further confirmed that for a sample of Canadian firms' financial constraints are important in explaining firm's higher cash holdings.

Faulkender and Wang (2006) argued that liquidity is more beneficial for financially constrained firms; thereby the marginal value of cash holdings is more for financially constrained firms than the unconstrained ones. Brown and Petersen (2010) reported that firms with financial constraints are dependent upon cash holdings in order to smooth their Research and Development spending, especially because cash provides a buffer for R&D from financial shocks and the high adjustment costs of R&D.

In a developing country context, Laeven (2003) studied the role of financial liberalisation on easing the financing constraints (measure by sensitivity of investment to cash flow) of the firms among developing countries including Pakistan. Results showed that financial liberalisation relaxed the external financing constraints of small firms but increased the financing constraints of large firms.

Shen and Wang (2005) reported that for a sample of Taiwanese firm investment is less sensitive to cash flow when a firm has strong bank relationship, here bank relationship is used as a proxy for mitigating financing constraints. Thus, a firm held less cash flow in hand for future investment expenditures while, if a firm has weak bank relationship the investment is sensitive to cash flows. In case of Turkey, Arslan et al. (2006) showed that cash holdings act as an effective device against cash flow fluctuations. Its role become more important for financially constrained firms than unconstrained ones especially during the financial crisis period and it also influences their sensitivity of investment to cash flow.

Tong and Wei (2009) proposed a framework to quantify the importance of the finance shock to non-financial firms in 45 countries, including Pakistan. The methodological framework studied the underlying mechanisms by which a financial sector crisis may affect the real sector, and applied it to the case of the global financial crisis 2008. Results of the study showed that countries with rapid pre-crisis credit expansion, finance-sensitive firms experienced significantly worse performance of stocks.

In case of Pakistan, Sohail and Javid (2014) studied the short term under and overreaction effect for Pakistani firms, in the context of the 2008 Global Financial Crisis considering the period from September 2007 to 2009. The study findings revealed a consistent pattern in relation to prior studies on the subject, reflecting absence of any prominent evidence of short term under or overreaction effect in the case of the KSE both during and after the financial crisis events.

On the basis of above arguments following hypothesis are proposed:

**Hypothesis 1:** Financially constrained firms increase cash holdings in response to increase in cash flow volatility and during the financial crisis 2008.

**Hypothesis 2:** Financially unconstrained firms do not increase cash holdings in response to increase in cash flow volatility and during financial crisis 2008.

### 3. Data and variable measurement

Initially, all Pakistani firms listed on the KSE during the period 2003–2013 are included in the sample. However, financial firms are excluded because they hold liquid assets for different reasons than non-financial firms (Drobetz & Gruninger, 2007; Pinkowitz, Stulz, & Williamson, 2006). A primary source of data is firms' annual reports. As a supplementary source, 'Balance Sheet Analysis of Joint Stock Companies Listed on Karachi Stock Exchange', a publication of the SBP and website [opendoors.pk](http://opendoors.pk) is considered. These sources provide information about Balance Sheets, Income Statements and annual reports of all the listed non-financial<sup>1</sup> firms of Pakistan. Group/ungroup affiliation of the firms is obtained from the book 'Who Owns Pakistan?' by Shahid-ur-Rehman (1998) (Ghani & Asharf, 2005; Gohar & Karacaer, 2009). In addition, a firm's market valuation data are also required which is taken from [brecorder.com](http://brecorder.com).

The information about non-financial firms is refined, eliminating firms with errors or lost values for accounting variables use in the study. The study also removes firms that are presumably in financial distress as denoted by their negative equity figures. If cash and cash equivalents exceed the market value of capital, the observation is also removed, since the impact of cash holdings is considered extraordinary for these cases (Kim, Mauer, & Sherman, 1998). All variables are winsorised the at 1st and 99th percentiles to prevent outliers from affecting estimations (Cohen & Li, 2014; Shah, 2011). After applying the corresponding filters, a panel comprising 2988 observations of 261 firms is obtained. Panel data gives more degrees of freedom and it helps in calculating efficient estimates by controlling co-linearity among explanatory variables and also controls for unobserved heterogeneity.

Table 1 outlines the measurement of explanatory and control variables in the light of the discussion in the theoretical framework and literature review section. These variables have been widely used in cash literature.

### 4. Methodology

In order to test the impact of cash flow volatility on financially constrained and unconstrained firms, certain criteria are used which are borrowed from earlier literature. Previous literature has suggested a number of measures. Indeed, what constitutes a good measure for



financially constrained firms still undergoes heated debate (see, for example, Fazzari et al., 1988; Kaplan & Zingales, 1997). Following Alameida et al. (2004) and Arslan et al.'s (2006) four indices size, dividend payment, KZ index and business group affiliation are used in separating firms in to financially constrained and unconstrained groups.

#### **4.1. Firm size**

Firm size is the first criteria used in the study for separating firms into financially constrained and unconstrained groups over the sample period 2003–2013. Firms are assigned to financially constrained (unconstrained) group if they are in the bottom (top) quartile of size distribution. This ranking is based on annual basis. Firm size is used as criteria for financially constrained and unconstrained firms because it is argued that it is more difficult for smaller firms to obtain external financing as they are less known, young and having less fix assets to be used as collateral as compare to larger firms (Almaida et al., 2004; Luo, 2011).

#### **4.2. Dividend payment**

Dividend payment is the second criteria used in the study. For each year firms which pay dividend are assigned to unconstrained group and those which do not pay dividend are considered as constrained firms (Han & Qiu, 2007). This criterion is used because it is found in literature that financially unconstrained firms are more likely to pay higher dividends as compared to constrained firms (Almaida et al., 2004; Frésard & Frochiaux, 2004).

#### **4.3. KZ Index**

Rather than using constraint proxies based on single firm characteristics, a multidimensional measure is used developed by Kaplan and Zingales (1997). They showed that the likelihood of a firm to be financially constrained is collectively determined by profitability, growth opportunity, leverage ratio and cash holdings. Following Almaida et al. (2004) and Luo (2011) firms are grouped in to financially constrained and unconstrained firms using following equation.

$$\text{KZ index} = -1.002 \cdot \text{CF} + .283 \cdot \text{TQ} + 3.139 \cdot \text{L} - 39.368 \cdot \text{Dividends} - 1.315 \cdot \text{Cash} \quad (1)$$

Firms in the bottom (top) quartiles are ranked as financially unconstrained (constrained) and this ranking is done on annual basis.

#### **4.4. Business group affiliation**

Following Arslan et al. (2006) fourth criterion is group affiliation in which firms are assigned to financially unconstrained (constrained) groups if they belong to (do not belong) to another corporation. It is argued that business group affiliations are efficient economic arrangements that substitute for missing or inefficient outside institutions and markets (Ghani & Asharf (2005) ) that is why firms which are affiliated with business groups are considered as unconstrained. This criterion is important especially in Pakistan because of the prevalence of family owned business groups (Cheema, 2003).

**Table 1.** Names and measurement of the variables.

Name of Variables	Denoted by	Measured by
Cash	CASH	Ratio of cash and cash equivalents to net assets.
Cash Flow Volatility	CVCF	It is measured as coefficient of variation of the firm's yearly cash flow of past four years.
Cash Flow	CF	Ratio of cash flow to net assets.
Leverage	L	Ratio of total debt to net assets
Size	SIZE	Natural logarithm of firm's asset.
Growth Opportunities	TQ	Ratio of market value of equity plus book value of debt to net assets.
Crisis	CRISIS	Dummy variable which takes the value of 1 for the year 2007 and 2008 and zero otherwise.

Firms are classified in to constrained and unconstrained groups on the basis of above criterias. Following Han and Qui (2007) a dynamic panel cash holdings model is developed. This model is used in estimating the relationship between cash holdings and cash flow volatility for constrained and unconstrained groups of firm. The Hansen test is also applied for over identifying restrictions to investigate whether or not there exist a correlation between the instruments and the error term.

### Model

$$Cash_{it} = \beta_0 + \beta_1 CVCF_{i,t-1} + \beta_2 CF_{i,t} + \beta_3 Size_{i,t-1} + \beta_4 TQ_{i,t-1} + \beta_5 L_{i,t-1} + \beta_6 Cash_{i,t-1} + \beta_7 Crisis + \eta_i + \varepsilon_{it} \quad (2)$$

Where  $cash_{i,t}$  is the dependent variable of firm  $i$  at time  $t$ . Among independent variables the main variable of interest is cash flow volatility ( $CVCF_{i,t}$ ). Other variables include cash flow ratio ( $CF_{i,t}$ ), size ( $Size_{i,t}$ ), leverage ( $L_{i,t}$ ), Tobin's Q ( $TQ_{i,t}$ ) and  $Cash_{i,t}$  which is lagged value of dependent variable. Crisis is the dummy variable which takes the value of 1 for the year 2007 and 2008 and 0 otherwise.  $\eta_i$  measures unobservable heterogeneity and is the error term.

## 5. Empirical results

Table 2 shows the Pearson correlation coefficients for alternative measures of financial constraints used in the study. All correlation coefficients are positive and significant except for the correlation between KZ index with size and dividend payment. Almada et al. (2004) also used the Kaplan and Zingales (1997) index as financial constraints index and find that KZ index is negatively correlated with other indices. Correlation coefficients are significant but they are not high enough to cause the multicollinearity problem.

Table 3 presents the summary statistics of the variables use in study. The table reports the mean, median, standard deviation and quartiles for each variable. Results showed that on average the sample firms hold 15.3% of their assets in the form of cash and cash equivalents with the median of 4.5%. The mean cash ratio found here is very much closer to other related studies (see for example, Afza & Adnan, 2007; Ferreira & Vilela, 2004 and Opler et al., 1999). The average size of the sample firm is 6.439. This shows that firms are bigger in terms of their assets but they do not have high growth opportunities as shown by their average Tobin's Q ratio, i.e., 1.234.

**Table 2.** Correlation matrix.

	Size	Dividend	KZ index	Group Affiliation
Size	1			
Dividend	0.130 (0.01)***	1		
KZ index	-0.102 (0.03)**	-0.312 (0.04)**	1	
Group Affiliation	0.036 (0.05)**	0.010 (.311)	0.05 (0.621)	1

Notes: The table provides correlation among different Financial Constraint Criteria. These criteria are used to divide firms into constraint and unconstraint groups. P-values are reported in parenthesis, where \*\*\*, \*\*, \* indicate coefficients significance level: 1%, 5% and 10% respectively.

Source: Authors' calculations.

**Table 3.** Descriptive statistics.

Variables	Mean	Std	25th percentile	Median	75th percentile
Cash <sub>it</sub>	0.153	0.512	0.007	0.045	0.126
CVCF <sub>it</sub>	3.245	45.649	0.341	0.363	1.329
CF <sub>it</sub>	0.1553	0.512	0.032	0.126	0.084
Size <sub>it</sub>	6.439	1.332	5.297	6.290	7.342
Tq <sub>it</sub>	1.234	0.503	0.892	0.959	1.394
L <sub>it</sub>	0.512	0.310	0.259	0.356	0.635

Notes: The table provides descriptive statistics of variables used in the study. The variables are Cash measure as cash and cash equivalents to net assets (Cash<sub>it</sub>), Cash Flow volatility measure as coefficient of variation of the firm's yearly cash flow of past four years (CVCF<sub>it</sub>), Cash Flow measure as operating income before depreciation normalised by net of assets (CF<sub>it</sub>), Size measure as natural log of total assets (Size<sub>it</sub>), Tobin's Q measure as a ratio of market value of equity plus the book value of debt to total assets (Tq<sub>it</sub>) and leverage which is measure as ratio of debt to total assets (L<sub>it</sub>).

Source: Authors' calculations.

**Table 4.** Cash flow volatility and cash holdings.

Financial Constraints Criteria								
	Size		Dividend		KZ index		Group Affiliation	
	Unconstrained Firms	Constrained Firms	Unconstrained Firms	Constrained Firms	Unconstrained Firms	Constrained Firms	Unconstrained Firms	Constrained Firms
CVCF <sub>it-1</sub>	-0.013 (0.863)	0.016 (0.026)	-0.139 (0.294)	0.0005 (0.035)	0.001 (0.329)	0.042 (0.384)	0.027 (0.279)	0.0014 (0.032)
CF <sub>it</sub>	0.054 (0.032)	0.005 (0.028)	4.335 (0.082)	0.0017 (0.024)	0.563 (0.258)	-0.432 (0.338)	0.175 (0.035)	0.118 (0.056)
Size <sub>it-1</sub>	0.251 (0.341)	0.6535 (0.217)	-1.132 (0.339)	-0.182 (0.212)	0.232 (0.718)	-0.028 (0.755)	0.216 (0.366)	-0.032 (0.721)
TQ <sub>it-1</sub>	-0.346 (0.225)	0.025 (0.537)	0.581 (0.352)	0.075 (0.511)	0.286 (0.717)	0.388 (0.804)	-0.225 (0.352)	-0.433 (0.043)
L <sub>it-1</sub>	2.813 (0.052)	-0.276 (0.084)	3.443 (0.237)	-0.156 (0.271)	0.216 (0.475)	0.035 (0.652)	0.354 (0.032)	-0.632 (0.354)
Cash <sub>it-1</sub>	0.031 (0.056)	0.325 (0.035)	0.075 (0.752)	0.563 (0.023)	0.252 (0.832)	0.239 (0.426)	0.156 (0.363)	0.529 (0.042)
CRISIS	0.19 (.06)	0.22 (.026)	0.29 (.075)	0.34 (.036)	0.25 (.132)	.28 (.09)	.38 (.293)	.34 (.013)
Hansen Test (df)	7.134(13)	6.515(18)	2.683(15)	10.709(20)	6.090(16)	6.215(15)	4.129(15)	5.075(16)

Notes: The table provides the estimation output of the model used in the study performed through GMM. Here cash (Cash<sub>it</sub>) is the dependent variable. Independent variables include cash flow volatility (CVCF<sub>it-1</sub>), cash flow (CF<sub>it</sub>), size (size<sub>it-1</sub>), Tobin's Q (TQ<sub>it-1</sub>), lagged value of cash and crisis dummy which takes the value of 1 for 2007–2008 and 0 otherwise. This model is applied when firms are classified into constrained/unconstrained groups on the basis of four Financial Constraint criteria, i.e., Size, Dividend, KZ index, Group Affiliation. Hansen test of over identifying restriction is implied with null hypothesis of instrument validity. P-values are reported in parenthesis.

Source: Authors' calculations.

Table 4 presents the Generalised Method of Moments (GMM) estimation results of dynamic penal regression models for financially constrained and unconstrained firms used in the study. In equation 2 the main variable of interest is cash flow volatility of cash holdings, rest of the variables are control variables which are conventional and have been found in literature to have significant explanatory power on the cash holding decisions of firms (Almaida et al., 2004; Martinez-carrascal, 2010). Most of the coefficients have expected signs for all the four constrained/ unconstrained criteria's.

Consistent with the results of Han and Qui (2007), McVanel and Perevalov (2008) and Martinez-carrascal, (2010) it is found that cash flow volatility is significantly positively related with cash holdings of financially constrained firms in Pakistan while for unconstrained firms the relationship is insignificant. This relationship supports the precautionary motive of holding cash for constrained firms. Furthermore, the positive link between cash holdings and cash flow volatility of firms with limited access to external finance indicates a negative relationship between current investment and cash flow volatility for financially constrained firms than unconstrained firms. These results explain that financially constrained firms save cash today in order to fund future investment opportunities. But, saving cash today may cause the firm to forgo current positive net present value projects, which may prove costly. Thus, financially constrained firms will achieve an optimal cash policy that trades off current investments against profitable future investments. On the other hand, financially unconstrained firms do not have any cost for holding cash because no current period investments are left and they derive less benefit from holding cash (Almaida et al., 2004).

Results also show positive and significant relationship between cash holdings and cash flows. This relationship is consistent with the argument that firms save cash out of cash flows to finance future investments because of a wedge between internal and external cost of funds (Khurana et al., 2006). The coefficient on the lagged dependent variable is less than unity and statistically significant, indicating stationarity and persistence in cash holdings (Martinez-Carrascal, 2010; Sher, 2014). The result on KZ index is puzzling and does not confirm the hypothesis. Almaida et al. (2004) also reported similar results for KZ index and they point the contradictory finding to the fact that KZ index may not be a good measure of financial constraints. Crisis variable is also significantly positive for constrained firms in all the four criteria and for unconstrained firms it was significant when the financial constraint was size and dividend payment. This finding shows that during financial crisis 2008 constrained firms save more cash than the unconstrained ones. In some cases, unconstrained firms also save cash but the significance is low as compared to constrained firms. This result is consistent with the findings of Arslan et al. (2006) for a sample of Turkish firms. This finding explains that cash reserves of firms can be used effectively as a hedging device against the fluctuations in cash flow and financial constraints, which restrict the ability of firms to undertake profitable investment opportunities and cash stands as an effective device for firms mainly, during the crisis period.

For all regression specifications, Hansen (1982) chi-square test statistic showed that for the null hypothesis the model's over identifying restrictions are valid, i.e., the estimated orthogonality conditions are sufficiently close to zero.

Overall, it can be said that results support the hypothesis. Cash flow volatility is significantly and positively related with cash holdings of financially constrained Pakistani firms. However, it is insignificant for financially unconstrained firms.

Financial flexibility is considered as the most important goal of firms' financial policy. These policies made sure that funding for present and future investments are available in a world where contracting and information frictions are present. These frictions affect the marginal costs and benefits of various projects depending on firm's financial position. Managers not only react to financing frictions when they occur, but they also anticipate future frictions and adjust the firms' policies accordingly so that the impact of these frictions is minimised (Almaida et al., 2011).

Khurana et al. (2006) in their cross-country study showed that the sensitivity of cash holdings to cash flows decreases with financial development. Their sample includes Pakistan and on the basis of different criteria Pakistan is considered as financially underdeveloped. Result of the study showed that the sensitivity of cash holdings to cash flows decreases with financial development. Thus, it can be implied from the results of current study that financially constrained and unconstrained firms in Pakistan show significant differences in their cash holding policies. Cash holding policies of constrained firms are more conditioned on the cash flow volatility while for unconstrained firms no such relationship holds (like Almaida et al., 2004 and Han & Qiu, 2007).

## 6. Conclusion

This empirical chapter examines the relationship between financial constraints, cash holdings and cash flow volatility in the presence of financial crisis 2008. Following Han and Qui (2007) a positive relationship is expected between cash holdings and cash flow volatility of financially constrained firms while no such relationship is expected for unconstrained firms.

Firms are divided into constrained and unconstrained groups on the basis of four criteria, i.e., dividend payment, KZ index, firm size and group affiliation. Results showed that financially constrained firms increase their cash holdings when cash flow volatility increases while unconstrained firms do not. The study delivers important insights in to understanding the cash related behaviour of firms in developing country context like Pakistan.

The existing literature has a debate about the appropriate relationship between investment-cash flow sensitivity of a firm and financial constraints. On one hand, Fazzari et al. (1988) argued that investment to cash flow sensitivity is high for financially constrained firms than the unconstrained ones. On the other hand, Kaplan et al. (1997) pointed out that financially unconstrained firm's exhibit greater investment cash flow sensitivity than constrained firms. Overall, the evidence in this study shows that financially constrained firms increase their cash holdings when cash flow volatility increases while unconstrained firms do not. As such, this study contributes in two distinct areas. First, the study adds to the literature on cash holdings, more specifically its importance for firms in less developed countries like Pakistan. In Pakistan, external finance is not easily available due to less financial development and weak law enforcement bodies. This situation makes present study more valuable for Pakistan because it specifically focuses on constrained firms which are in need of cash due to volatile cash flows and high growth opportunities. Second, the study adds to the literature related to corporate saving behaviour of cash holdings. Prior literature suggested that firms increase their cash holdings in response to increase in cash flow volatility (see, for example, Opler et al., 1999). This is the first study of its kind which has provided a direct analysis of the relationship between cash holdings, cash flow uncertainty and financial constraints during the crisis period of 2008 in the context of Pakistan. The

results of the study also contribute to firm's investment decisions by describing that degrees of financial constraints and cash flow volatility affect the investment decisions of the firm. As such these results substantiate the recent findings which document that firms with high cash flow volatility invest less due to the high costs of external financing (see, for example, Acharya et al., 2005; Minton & Schrand, 1999). The evidence provided in this study is based on the analysis of firms in Pakistan. Such an analysis will also allow in investigating the influence of country specific characteristics on cash holding and potential interactions between these characteristics and firm specific ones.

## Note

1. Sample firms include non-financial firms comprising of manufacturing, non-financial services and retail firms listed on the KSE during the period 2003–2013. Financial firms including banks, insurance, real estate and trading firms are excluded from the sample because their cash holdings may be subject to extraneous influences, such as government regulations (Faleye, 2004).

## Disclosure statement

No potential conflict of interest was reported by the authors.

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